

WP7: PROJECT MANAGEMENT AND COORDINATION

WP1: EXTERNAL HAZARDS CHARACTERIZATION

- Improving multi-hazard characterization for PSA*, accounting for simultaneous-yet-independent or cascading events (earthquakes, floods, high winds...).
- Proposing a unique framework for scenarios likely to occur in European context.

WP2: FRAGILITY ASSESSMENT OF MAIN NPPs* CRITICAL ELEMENTS

Improving physical and functional fragility assessment of main SSCs* in referential NPPs*, to account for ageing effects, possible interactions and interdependencies...

WP3: INTEGRATION AND SAFETY ANALYSIS

- Integrating risk and safety assessment as well as Human Reliability Analysis, based on Bayesian modelling.
- Improving evaluation and treatment of uncertainties, including those related to expert judgment integration.

WP4: APPLYING & COMPARING VARIOUS SAFETY ASSESSMENT APPROACHES ON A VIRTUAL REACTOR

- Defining a simplified virtual PWR* NPP*, representative of the generations II & III European fleet.
- Defining and implementing model reduction strategies useful for PSA* of NPPs*.
- Testing and validating the applicability of the proposed solutions and frameworks for PSA* & DSA* of generic PWR* NPP*.

WP5: SUPPORTING TOOL FOR SEVERE ACCIDENT MANAGEMENT

- Defining a referential operating PWR* NPP* with its generic Severe Accident Management Guidelines.
- Developing the hazard-induced damage states and specific Accident Progression Event Trees for demonstration purposes.

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DSA Deterministic Safety Analysis
PSA Probabilistic Safety Assessment
PWR Pressure Water Reactor
NPPs Nuclear Power Plants
SSCs Systems, Structures and Components

WP6: DISSEMINATION, RECOMMENDATIONS AND TRAINING

NEW APPROACH TO REACTOR SAFETY IMPROVEMENTS

A **European project** with 18 leading European institutions to **propose progress in Probabilistic Safety Assessment Fundamentals** for Nuclear Power Plant Safety in case of multiple external natural events.

MISSION

NARSIS aims at improving the nuclear safety assessment methodologies for generations II & III reactors, based on innovative research and tools.

Based on recent theoretical progresses, the main objective of NARSIS is to bring sound contributions to the safety assessment methodologies by reviewing, analyzing and developing/improving some aspects relative to the following topics:

- Assessment of external natural hazards focusing on scenarios with concomitant events (either simultaneous-yet-independent or cascading) and re-evaluation of screening criteria;
- Assessment of the physical and functional fragility of main critical systems, structures and components (SSCs) of Nuclear Power Plants (NPPs), subjected to complex aggressions, considering ageing effects and possible interactions (e.g. soil-structure in case of earthquakes);
- Constraining of expert judgments and treatment of parameter, model and completeness uncertainties;
- Integrated risk and safety assessment as well as Human Reliability Analysis, based on dynamic non-parametric Bayesian modelling;
- Level 2 Probabilistic Safety Assessment (PSA) procedures related to external events, including evaluation of accident management measures.

Four main primary hazards and then their related secondary effects/combinations, will be considered:

- Earthquakes;
- Riverine and coastal flooding;
- Meteorological hazards (wind, rain, temperature);
- Tsunamis.

OUTCOMES

The efforts of NARSIS will lead to providing a scientific framework to address:

- Theoretical improvements in natural multi-hazards assessment and their impacts, including the evaluation of the uncertainties and the reduction of subjectivity in expert judgments;
- Validation of the findings in the frame of the safety assessment through adequate model reduction strategies for simulations and finally,
- Application of the outcomes at the demonstration level by providing supporting tools for severe accident management.


BACKGROUND


PSA procedures allow practitioners to better understand the most causes prone to initiate nuclear accidents and to identify the most critical elements of the NPP systems. However, lessons learnt from the Fukushima Daiichi nuclear disaster point out the necessity of upgrading the current methodological framework related to areas such as cascading and/or conjunct events characterization, structure responses and uncertainties treatment. New developments in those areas would even enable the extension of their use in accident management.


FACTS & FIGURES

**Call H2020 - NFRP-2016-2017-1
Research & Innovation Action**

 4 years
Sept. 2017 - Aug. 2021

 608 Person-months
18 Partners + 1 Linked Party

 Project Cost: 5,470,829 €
EU Contribution: 4,965,472 €

 8 Work
Packages
(WPs)

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PARTNERS



**Warsaw University
of Technology**



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